AmerenUE
Callaway Plant

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Fulton, MO 65251

November 19, 2003

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop P1-137
Washington, DC 20555-0001

Ladies and Gentlemen: ULNRC-04920

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
RESPONSE TO NRC BULLETIN 2003-02,
"LEAKAGE FROM REACTOR PRESSURE VESSEL LOWER HEAD PENETRATIONS AND REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY"
Ref: ULNRC-04799, dated January 30, 2003

Attached is the Callaway Plant response to U.S. Nuclear Regulatory Commission (NRC) Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity," dated August 21, 2003. NRC Bulletin 2003-02 requested information concerning our RPV lower head penetration inspection program that has been implemented, the inspection program that will be implemented during the next and subsequent refueling outages, and a summary report following performance of the inspections.

In the reference letter, Callaway Plant has committed to performing formal visual inspection of the lower reactor pressure vessel head penetrations starting with refueling outage 13 (spring 2004).

Attachment II lists AmerenUE commitments contained in this correspondence.

If you should have any questions regarding this submittal, please contact us.

Very truly yours,

Keith D. Young

Keith D. Young
Manager - Regulatory Affairs

KDY/BFH
Attachments: I – Response to NRC Bulletin 2003-02
II – List of Commitments

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STATE OF MISSOURI)
) S S
COUNTY OF CALLAWAY)

Keith D. Young, of lawful age, being first duly sworn upon oath says that he is Manager, Regulatory Affairs for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Keith D. Young
Keith D. Young
Manager, Regulatory Affairs

SUBSCRIBED and sworn to before me this 19th day of November, 2003.

CATHY J. CRISP MY COMM. EXP. NOTARY SEAL NOTARY PUBLIC JAN. 29, 2006 STATE OF MISSOURI

Cathy J. Crisp
Notary Public
State of Missouri
Expiration 1-29-06

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**RESPONSE TO NRC BULLETIN 2003-02:
"LEAKAGE FROM REACTOR PRESSURE VESSEL
LOWER HEAD PENETRATIONS AND REACTOR COOLANT PRESSURE
BOUNDARY INTEGRITY"**

On August 21, 2003, the Nuclear Regulatory Commission (NRC) issued Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity." The NRC requested that specific information be provided within 90 days of the date of the Bulletin. Callaway Plant hereby responds to the 90-day information request set forth in the Bulletin. The Bulletin's "Required Information" is shown in italics.

NRC Request: *All subject PWR addressees are requested to provide the following information. The responses for facilities that will enter refueling outages before December 31, 2003, should be provided within 30 days of the date of this bulletin. All other responses should be provided within 90 days of the date of this bulletin.*

NRC Request 1(a): *A description of the RPV lower head penetration inspection program that has been implemented at your plant. The description should include when the inspections were performed, the extent of the inspections with respect to the areas and penetrations inspected, inspection methods used, the process used to resolve the source of findings of any boric acid deposits, the quality of the documentation of the inspections (e.g., written report, video record, photographs), and the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of the RPV lower head penetrations.*

Response:

Dates of, extent and method of RPV lower head penetration inspections: The insulation on the bottom of the Reactor Pressure Vessel (RPV) at Callaway Plant is such that personnel are able to enter between the insulation and vessel and have room to walk completely around the vessel. The distance between the vessel and insulation at the lowest point is approximately three feet. As part of the ASME Section XI system leakage test performed every refueling outage, with the system at normal operating temperature and pressure, the bottom of the vessel is inspected by opening a hatch in the insulation and looking directly at the vessel from the location of the hatch. Results of these inspections are recorded on a VT-2 Examination Report. In addition to the ASME Section XI inspections, during Refuel 12 (Fall 2002) and again during the Summer Reliability Outage (Spring 2003), this area was inspected by entering the area between the insulation and vessel and walking 360 degrees around the vessel. All penetrations were visible and each was inspected.

Process used to resolve source of findings of boric acid deposits, documentation thereof: No indications of leakage from the penetrations were present. Staining of the vessel from past cavity seal leaks was observed emanating from above the main loop nozzles, traveling down the sides and bottom of the vessel, and onto the insulation below. The stains are rust colored with a thin layer of boric acid residue present. Locations are present where these stains are flaking away from the side of the vessel

indicating that it has not penetrated the vessel coating. Where the stains contacted the RPV lower head nozzles, no boron or rust is present at the penetration. Some of the nozzles have a ring of boron residue around them, but the residue is located 1/8 to 1/4 inch below the penetration. Because of the clear evidence that all staining originated from past cavity seal leakages as well as the location and appearance of deposits being inconsistent with leakage through the bottom mounted instrument nozzles or their respective j-groove weld, it was determined that no active pressure boundary leaks existed in these locations.

A written report of these inspections is recorded in the Callaway Action Request System (CARS). Photographs were taken of the general areas where staining has occurred in order to compare results between inspections. Because there were no deposits at the nozzle-base metal interface, photographs of these locations were not taken.

Basis for concluding that Callaway Plant satisfies applicable regulatory requirements related to the integrity of the RPV lower head penetrations: Based on the fact that no indications of leakage were present when examined by direct visual observation, Callaway satisfies applicable regulatory requirements related to the integrity of the RPV lower head penetrations. Furthermore, Callaway Plant has reasonable assurance that the reactor pressure vessel lower head penetrations are capable of fulfilling all license and design basis requirements and that these requirements will continue to be met.

The following regulatory requirements were cited in the Bulletin as providing the basis for the Bulletin's assessment:

- Appendix A to 10 CFR Part 50, General Design Criteria for Nuclear Power Plants, Criteria 14 – Reactor Coolant Pressure Boundary, Criteria 31 – Fracture Prevention of Reactor Coolant Pressure Boundary, and Criteria 32 - Inspection of Reactor Coolant Pressure Boundary
- Appendix B of 10 CFR Part 50, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Criteria V (Instructions, Procedures and Drawings), IX (Control of Special Processes), and XVI (Corrective Action)
- 10 CFR 50.55a, Codes and Standards, which incorporates by reference Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, of the ASME Boiler and Pressure Vessel Code
- Plant Technical Specifications

Additionally, the following regulatory requirements are also pertinent:

- NRC Generic Letter 88-05, Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants

General Design Criteria (GDC):

GDC 14 specifies that the reactor coolant pressure boundary be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 31 specifies that the reactor

coolant pressure boundary be designed with sufficient margin to assure that the probability of rapidly propagating fracture is minimized. GDC 32 specifies that components that are part of the reactor coolant pressure boundary be designed to permit periodic inspection and testing of important areas and features to assess their structural and leaktight integrity.

As part of the original design and licensing, Callaway Plant demonstrated that the design of the reactor coolant pressure boundary meets these requirements. Callaway Plant complied with these criteria in part by: 1) selecting corrosion resistant materials with high fracture toughness for reactor coolant pressure boundary materials; and 2) following ASME Codes and Standards for fabrication, erection, and testing of the pressure boundary parts. As described above, the requirements established for design, fracture toughness, and inspectability in GDC 14, 31, and 32, respectively, were satisfied during the initial design and licensing, and continue to be satisfied during operation.

Quality Assurance Requirements (10 CFR 50, Appendix B):

The Bulletin states that special processes, including nondestructive testing, shall be controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements, as required by Appendix B, Criteria V (Instructions, Procedures, and Drawings) and Appendix B, Criteria IX (Control of Special Processes). Callaway Plant programs comply with these standards.

Criterion XVI (Corrective Action) of Appendix B states that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. For significant conditions adverse to quality, the measures taken shall include root cause determination and corrective action to preclude repetition of the adverse conditions.

If any cracking, leakage or degradation is detected during the RPV lower head penetration inspections described above, corrective actions will be taken in accordance with CARS system and plant procedures. Any reactor coolant pressure boundary leakage or degradation would be considered a significant condition adverse to quality and appropriate actions, including a cause analysis, will be taken.

Inspection Requirements (10 CFR 50.55a and ASME Section XI):

The Bulletin describes the requirements for inspection in accordance with the ASME Code, the detection of leakage from insulated components, and the acceptance standards if through wall leakage is detected. Callaway Plant has complied with the inspection requirements for insulated components as part of the Callaway Plant Inservice Inspection (ISI) program.

Since the bottom head is insulated, and the Bottom Mounted Instrument (BMI) nozzles do not represent a bolted flange, the Code permits these inspections to be performed with the insulation left in place, however Callaway Plant performs these inspections by accessing the space between the insulation and the reactor pressure vessel, as

described previously. Callaway Plant also complies with the requirements of Generic Letter 88-05 by performing walkdowns during refueling outages. If conditions are identified in the course of these inspections, corrective actions are performed, including supplemental examinations, repairs and/or evaluations, and inspections for consequential degradation of carbon steel or low alloy steel.

Plant Technical Specifications:

The limits for Callaway Plant reactor coolant leakage are provided in Technical Specification (TS) 3.4.13, and are stated in terms of the amount of leakage (i.e., 1 gallon per minute for unidentified leakage; 10 gpm for identified leakage; and no pressure boundary leakage). Routine surveillance testing is performed to ensure these requirements are met. If leakage is detected by the on-line leak detection systems, the leak will be evaluated per the TS, and the plant will be shut down if required. Upon detection and identification of a leak, corrective actions will be taken to restore reactor coolant pressure boundary integrity. Callaway Plant continues to meet the requirements of this TS.

Additional Regulatory Requirements and Industry Best Practices:

Callaway Plant complies with the requirements of GL 88-05, by having and maintaining a boric acid corrosion program which is in compliance with the requirements thereof (discussed above).

Callaway Plant has been actively participating in industry organizations, such as Westinghouse Owners Group and Material Reliability Program, and continues to be aware of industry experience. Industry best practices are evaluated and if applicable to Callaway, implemented. Examples of this are improvements to the Boric Acid Corrosion program and supplemental NDE in the upcoming 10-year RPV Examination (discussed in response to question 1b, below).

Based upon the evaluation provided above, Callaway Plant continues to comply with the regulatory requirements described in NRC Bulletin 2003-02.

NRC Request 1(b): *A description of the RPV lower head penetration inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the extent of the inspections which will be conducted with respect to the areas and penetrations to be inspected, inspection methods to be used, qualification standards for the inspection methods, the process used to resolve the source of findings of boric acid deposits or corrosion, the inspection documentation to be generated, and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of the RPV lower head penetrations.*

Response:

Extent of the inspections: In Reference 1, Callaway Plant committed to visually inspecting the BMI penetrations each refueling outage beginning with Refueling Outage 13(RF13) (Spring 2004). All 58 BMI penetrations including 100% of the circumference of each penetration as it enters the RPV lower head will be visually inspected.

Inspection methods: The examination method for the BMI at Callaway will be direct visual (VT-2).

Qualification standards: The visual examination personnel will be Certified VT-2 Level II or VT-2 Level III.

Process used to resolve the source of findings: Callaway will utilize CARS to evaluate any and all findings of leakage during the BMI penetration examinations. The process will include evaluations to determine if the findings of leakage are relevant or non-relevant as an RCS leak as well as the source of the leakage. Examples of relevant leakage are identified in the March 2003 EPRI report "Visual Examination for Leakage of PWR Reactor Head Penetrations, Rev. 2," supplemented by the as found pictures of the boric acid accumulation at South Texas Project Unit 1 (STP-1) at BMI locations #1 and #46 available on the NRC web site to determine characteristics of relevant indications. Unlike the reactor vessel head upper penetrations, the bottom head location has no potential leak source location during normal plant operation that could result in boron accumulation. Cavity seal ring leakage that occurs during a refueling outage only occurs at low temperature and results in staining without "popcorn like" accumulation features of an RCS leak at normal operating temperature. The lower head location of the BMI penetrations is also not likely to be affected by settled debris that could mask relevant indications. Tools to evaluate relevant indications of leakage (boron accumulation) would likely include sample collection for chemical and isotopic analysis.

Examples of non-relevant leakage may include thin films or stains of boron or light surface rust with no accumulation around the penetration. Non-relevant indications would also typically have a trail leading to a source other than a BMI penetration.

Documentation of the visual inspections: The examinations will be documented per station practices which comply with ASME code and the stations Operating Quality Assurance Manual. Video and/or photographic images of relevant indications will be taken to support the examination findings and will supplement the report.

Additional actions scheduled for RF13: In addition to the commitment to perform visual inspections of the RPV lower head penetrations, during RF13 Callaway plans on performing volumetric NDE of the RPV lower head penetrations as well as cleaning of the RPV lower head. In response to the findings at South Texas Project (Spring 2003), Callaway felt that it was prudent to expand the scope of the 10-year vessel examination to include NDE on the BMI nozzles. Callaway expects to volumetrically examine the BMI nozzles and perform a surface examination of the wetted surface of the j-groove welds (eddy current or enhanced visual). Final determination of the exact NDE

technique to be used has not been made at this time. That determination will be based on results from MRP/EPRI demonstrations (if available), lessons learned from the STP experience and consultation with industry experts.

Callaway also plans on cleaning the RPV lower head during RF13. Callaway has stains on the RPV from past cavity seal leaks and the cleaning is an effort to assist in future visual inspections of the RPV lower head penetrations.

Documentation of the BMI NDE: Documentation of the NDE will be in accordance with the selected vendors documentation requirements as well as station procedures and policies related to NDE examinations.

Basis for concluding that your plant will satisfy applicable regulatory requirements: As stated in response to Item 1(a), Callaway Plant has been performing inspections of the RPV lower head in accordance with ASME Section XI requirements. In addition to these inspections, a bare-metal-visual inspection of the BMI nozzles has been performed twice since RF12 (Fall 2002). Performance of a bare-metal-visual exam each refueling outage, as Callaway Plant has committed to, will ensure all applicable regulatory requirements are satisfied.

NRC Request 1(c): *If you are unable to perform a bare-metal visual inspection of each penetration during the next refueling outage because of the inability to perform the necessary planning, engineering, procurement of materials, and implementation, are you planning to perform bare-metal visual inspections during subsequent refueling outages? If so, provide a description of the actions that are planned to enable a bare-metal visual inspection of each penetration during subsequent refueling outages. Also, provide a description of any penetration inspections you plan to perform during the next refueling outage. The description should address the applicable items in paragraph (b).*

Callaway Response to NRC Request 1(c): Callaway Plant has shown that all 58 BMI nozzles are accessible and 100% of the circumference of each nozzle can be inspected.

NRC Request 1(d): *If you do not plan to perform either a bare-metal visual inspection or non-visual (e.g., volumetric or surface) examination of the RPV lower head penetrations at the next or subsequent refueling outages, provide the basis for concluding that the inspections performed will assure applicable regulatory requirements are and will continue to be met.*

Callaway Response to NRC Request 1(d): Callaway Plant will be performing bare metal visual inspections at the next and subsequent refueling outages.

NRC Request 2. *Within 60 days of plant restart following the next inspection of the RPV lower head penetrations, the subject PWR addressees should submit to the NRC a summary of the inspections performed, the extent of the inspections, the methods used, a description of the as-found condition of the lower head, any findings of relevant indications of through-wall leakage, and a summary of the disposition of any findings of boric acid deposits and any corrective actions taken as a result of indications found:*

Callaway Response to NRC Request 2:

Callaway Plant will provide this request within 60 days after plant restart following the next inspection.

References:

1. ULNRC-04799, "Response to Request for Additional Information, NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity"", January 30, 2003.

2. ULNRC-1779, "Response to Generic Letter 88-05 Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants", May 27, 1988.

3. NRC Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity", August 21, 2003.

LIST OF COMMITMENTS

The following table identifies those actions committed to by AmerenUE in this document. Any other statements in this document are provided for information purposes and are not considered commitments. Please direct questions regarding these commitments to Mr. David E. Shafer at (314) 554-3104.

COMMITMENT	Due Date/Event
Provide the information requested in Bulletin 2003-02, Item 2.	60 days following plant restart from RF13
Perform visual inspection of the lower reactor pressure vessel head penetrations as committed to in reference 1.	Each refueling outage